Delaware River & Bay Nutrient Criteria Plan: Updated Approach, Tasks, and Timeline

(Version 3 - November 2017)

Delaware River Basin Commission
DELAWARE · NEW JERSEY
PENNSYLVANIA · NEW YORK
UNITED STATES OF AMERICA

Introduction

This document is an update and modification of the Delaware River Basin Commission's (Commission or DRBC) Nutrient Criteria Development Plan. Since the previous nutrient criteria plan was published in 2013, many changes have occurred warranting a change in direction and priority. These changes include, but are not limited to adoption of multiple DRBC Resolutions, completion of assessments of the effectiveness of the Commission's Special Protection Waters (SPW) program, issuance of an EPA memorandum regarding numeric nutrient criteria, and initiation of the development of a Delaware Estuary Eutrophication model. This edition reflects specific changes to approaches, tasks, and timeline for nutrient criteria development in accordance with those developments since 2013. Broader discussions of history, concepts, and overview are available in the previous Nutrient Criteria Plan and are not addressed in this document.

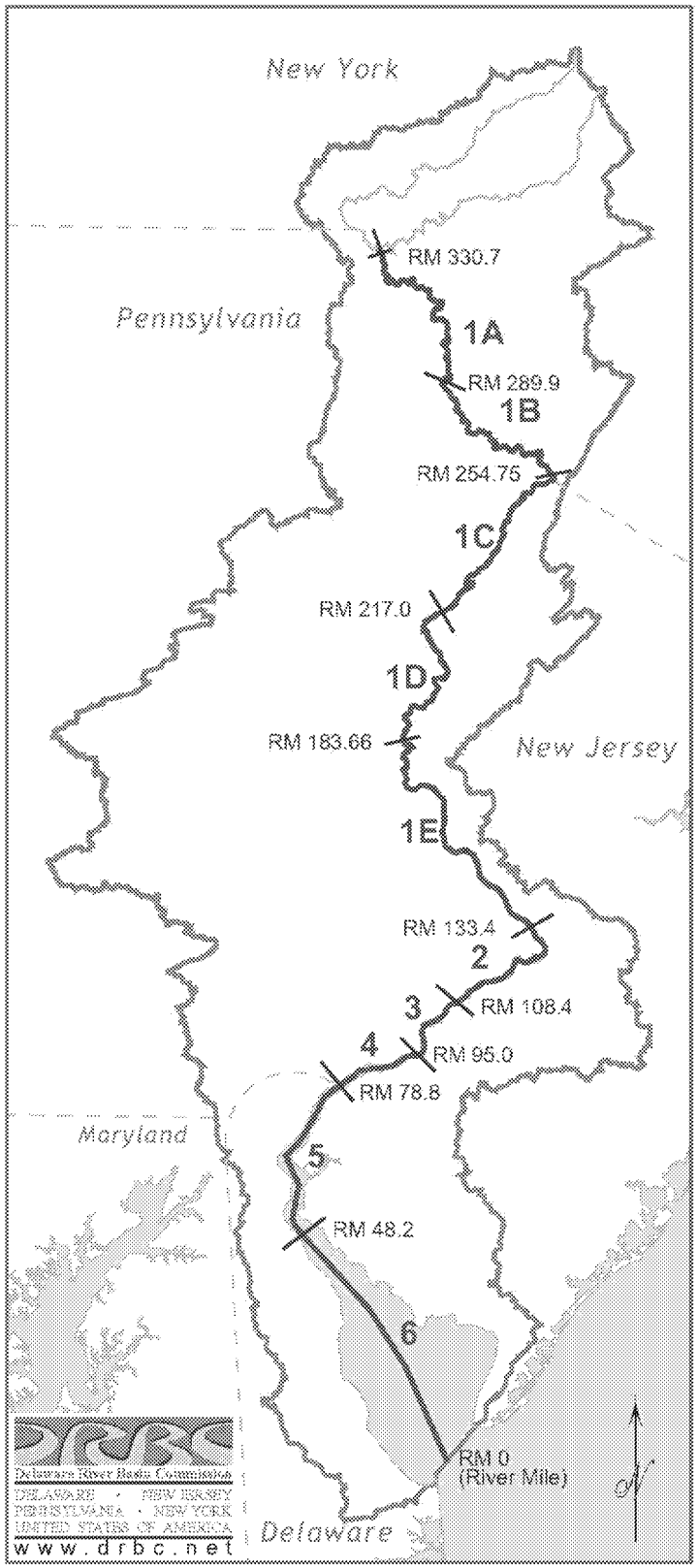
This Nutrient Criteria Plan lays out the specific tasks that will be conducted by the Delaware River Basin Commission (Commission) and its partners over the course of the coming years to develop, propose, and implement numeric nutrient or nutrient-related criteria for the shared waters of the Delaware River and Bay.

This document addresses the development of nutrient criteria in two separate sub-reaches of the Delaware River as illustrated in Figure 1:

- The Delaware Estuary, including the tidal Delaware River and the Delaware Bay, from River Mile 0 through River Mile 133.4; and
- The Non-tidal Delaware River, from River Mile 133.4 through River Mile 330.7;

While this Nutrient Criteria Plan seeks to anticipate many of the challenges in the years ahead, DRBC acknowledges that this plan will likely evolve considerably throughout its implementation.

Figure 1. DRBC Water Quality Management Zones for the Delaware River and Estuary



Nutrient Criteria Development in the Delaware Estuary

Background and Justification

In a memorandum dated September 22, 2016, the US Environmental Protection Agency (USEPA) stated:

> *Nutrient pollution remains one of the greatest challenges to our Nation's water quality and presents a growing threat to public health and local economies - contributing to toxic harmful algal blooms, contamination of drinking water sources, and costly impacts on recreation, tourism and fisheries.*

That memorandum called on States and stakeholders, in collaboration with USEPA, to intensify efforts to take continued and concerted action to address nutrient pollution. EPA identified nutrient criteria development priorities including:

- Prioritizing Watersheds and Setting Load Reduction Goals
- Reducing Point Sources of Nutrient Pollution
- Reducing Nutrient Loads from Nonpoint Sources
- Continued Progress on Developing Nutrient Criteria
- Transparency and Accountability

On September 13, 2017, the Delaware River Basin Commission (Commission) adopted Resolution 2017-4 specifying a goal of continuous improvement in shared waters, and calling for:

- Development and calibration of a eutrophication model for the Delaware River Estuary and Bay;
- Determination of the nutrient loadings from point and non-point sources that can be discharged while maintaining the levels of dissolved oxygen identified by the expert panel as those necessary to support key aquatic species;
- Identification and evaluation of the capital and operating costs of optimizing the best available technology or applying innovative technologies capable of achieving higher levels of dissolved oxygen.

On that same date, the Commission passed a resolution authorizing and directing the Executive Director to require additional nutrient monitoring for point source discharges to the Delaware River Estuary and Bay (Water Quality Zones 2 – 6) for development and calibration of the Delaware Estuary Eutrophication Model.

These resolutions documented the Commission's commitment to address low dissolved oxygen in the Delaware Estuary driven by discharge of nutrients. These resolutions capped a series of preceding resolutions pertaining to management of nutrients in the Delaware River and Bay including:

- On September 10, 2014, the Commission passed Resolution 2014 –9 authorizing the Executive Director to enter into an agreement for a study to assess the effects of low dissolved oxygen

levels and the presence of PCBs on the early life stages of the Atlantic sturgeon, a federally listed endangered species.

- On December 5, 2012, the Commission passed Resolution 2012 – 7 authorizing the Executive Director to engage an expert panel to advise the Water Quality Advisory Committee (WQAC) and the Commission on the development and use of a Delaware Estuary Eutrophication Model.
- On July 14, 2010, the Commission passed Resolution 2010 – 5 authorizing the Executive Director to require nutrient monitoring for point source discharges to the Delaware Estuary and Bay (Water Quality Zones 2 – 6).
- On July 16, 2008, the Commission passed Resolution NO. 2008 –09 to amend the *Water Quality Regulations, Water Code* and *Comprehensive Plan* by permanently designating the Lower Delaware River as Special Protection Waters with the classification Significant Resource Waters.
- On February 28, 2007, the Commission passed Resolution 2007 – 3 authorizing the Executive Director to enter into contracts for studies of the non-tidal portion of the Delaware River entailing the identification and evaluation of periphyton; nutrient stimulation of phytoplankton; and analysis of nutrients and bacteria.
- In 1992, the Commission adopted Special Protection Waters regulations for point source discharges, which were amended in 1994 to also include non-point source pollutant loadings carried by runoff. The regulations were enacted to protect existing high water quality in areas of the Delaware River Basin deemed "to have exceptionally high scenic, recreational, ecological and/or water supply values." They initially applied to a 121-mile stretch of the Delaware River from Hancock, N.Y. downstream to the Delaware Water Gap, and its drainage area.

The previous version of the nutrient criteria plan was published in 2013 and is available on the Commission web site at:
[HYPERLINK "http://www.nj.gov/drbc/library/documents/nutrients/del-river-estuary_nutrient-plan_dec2013.pdf"]

Tasks and Schedule

The section below outlines the tasks to be completed toward development of numeric nutrient criteria in the Delaware Estuary and the anticipated timetable for completion.

Table 1. Estuary Tasks & Timelines Associated with Numeric Nutrient Criteria

Task	Description	Completion Goal
E1	Hydrodynamic Model Development	December 2018
E2	Early Action to Achieve Improved Estuary DO	June 2020
E3	Identification of dissolved oxygen requirements of sensitive Delaware Estuary species at several life stages	July 2018
E4	Intensive Ambient Data Collection	June 2020
E5	Point Discharge Data Collection	June 2020
E6	Water Quality Model Development and Calibration	December 2020
E7	Technical and Economic Cost Evaluation	December 2020
E8	Determination of higher levels of DO & protection of aquatic species	December 2021
E9	Develop wasteload and load allocations	December 2021
E10	Publication & Public Comment, new Aquatic Life Use & DO criteria	June 2023
E11	Determination of TN and TP criteria consistent with DO criteria determined in step E8 and wasteload and load allocations determined in step E9	December 2023
E12	Publication & Public Comment, new estuary TN and TP criteria	December 2024

* - all dates are targets based on available resources and staff workloads; dates subject to change

Task E1. Hydrodynamic Model Development

The Commission will develop and calibrate coarse grid and fine grid hydrodynamic models with a target completion date of December 2018. This work has been initiated and resources including WPF grant, 106 grant, state funding, and DRBC funding have been identified and applied.

Task E2. Early Action to Achieve Improved Estuary DO

As indicated in Resolution 2017-4:

> Early actions to reduce oxygen depleting discharges. The Commission further directs the Executive Director to convene a workgroup consisting of state and federal coregulators to identify and encourage the implementation of practicable early actions that can be implemented by NPDES permittees in the near term to reduce the loading of ammonia and other oxygen depleting pollutants to the Estuary. The Commission recommends that the early action initiatives be led, coordinated, and managed by the appropriate state agencies and be supported through technical assistance provided by EPA and that this initiative commence without delay.

Coregulator members have been identified and the first meeting will be held in January 2018.

Task E3. Identification of dissolved oxygen requirements of sensitive Delaware Estuary species at several life stages

A task order has been issued to the Academy of Natural Sciences of Drexel University (ANSDU) to develop a methodology to complete this task. Upon completion of the methodology, the Commission will issue a second task order to ANSDU to develop a report documenting the dissolved oxygen requirements of sensitive Delaware Estuary species at several life stages. Completion of this report is targeted for July 2018.

Task E4. Intensive Ambient Data Collection

Under this task, the Commission is enhancing and expanding existing monitoring to provide a more comprehensive ambient data sets for calibration of the estuary eutrophication model during 2018 and 2019. This work has already been initiated and includes:

- Expansion of the Delaware Estuary Water Quality monitoring program (Boat Run) to year-round since January 2017;
- Monitoring nutrients at the Delaware River at Trenton, twice per month since January 2017. The Delaware River at Trenton is the largest freshwater inflow to the estuary;
- Monitoring nutrients at the Schuylkill River at Philadelphia, twice per month starting in January 2018. The Schuylkill River is the 2nd largest freshwater inflow to the estuary;
- Tributary nutrient monitoring. Initiated in 2017 with quarterly monitoring of 10 tributaries. This program will be expanded in 2018 with monitoring 8 times per year at approximately 25 tributaries.
- Installation of continuous real-time spectral analyzers:
    - Delaware River at Trenton for Nitrate starting January 2018;
    - Delaware River at Chester for Nitrate and DOC starting April 2018;
- Tentatively working on a cooperative effort with EPA for off-channel nutrient monitoring at different depths in the estuary for 2018 and 2019.

Task E5. Point Discharge Data Collection

Under this task, the Commission will require additional point discharge monitoring in support of calibration of the estuary eutrophication model. Facilities contributing to the 95% cumulative point discharge loading of ammonia, TKN, or BOD5 (Tier 1) will be required to monitor nutrients weekly beginning in March 2018. Facilities outside of Tier 1 contributing to the 95% cumulative point discharge load of TP, SRP, Nitrate-N, or TN (Tier 2) will be required to monitor monthly beginning in April 2018. Monitoring will continue for a period of two years, through the model calibration period.

Task E6. Water Quality Model Development and Calibration

Using a Modeling Expert Panel and modeling consultant to help guide model selection and development, DRBC staff will develop these models for implementation in-house. Model development includes compilation and analyses of available nutrients, climatological, hydrologic data. This work has

been initiated and resources including WPF grant, 106 grant, state funding, and DRBC funding have been identified and applied.

Task E7. Technical and Economic Cost Evaluation

The following tasks will be completed as part of the Technical and Economic Cost Evaluation:

- Identify technologies and operational changes at the top nutrient loading wastewater treatment plants in Delaware Estuary and estimate capital and operating costs for a range of effluent quality improvements. DRBC will competitively select and hire an engineering consulting firm to perform this work.
- Engage major wastewater treatment plants with the highest nutrient loadings serving Philadelphia, Wilmington, Camden, Gloucester County, and Delaware County as well as state and federal agencies for their site-specific and general knowledge of nutrient treatment options.
- For entities and communities identified above, assess:
    - Current rate structures in the communities served by the utilities.
    - Assess the impact to rates and taxes
    - Examine the ability to pay the increased cost for sensitive populations and areas.
    - Define societal benefits associated with achievement of improved dissolved oxygen.

DRBC solicited and obtained substantial funding from the William Penn Foundation and PA CZM grant in support of this portion of the overall project.

Task E8. Determination of higher levels of DO & protection of aquatic species

DRBC will use the eutrophication model from Task E6 in conjunction with the Technical and Economic Cost Evaluation from Task E7 to determine what levels of higher DO are attainable and the corresponding levels of protection to aquatic species from Task E3. This work will be conducted in consultation with the Water Quality Advisory Committee and the Eutrophication Model Expert Panel.

Task E9. Develop wasteload and load allocations

DRBC will use the eutrophication model from Task E6 to determine wasteload and load allocations needed to achieve the highest attainable DO identified in Task E8. This work will be conducted in consultation with the Water Quality Advisory Committee and the Eutrophication Model Expert Panel.

Task E10. Publication & Public Comment, new Aquatic Life Use & DO criteria

DRBC will initiate the public comment process for new aquatic life uses and corresponding DO criteria determined from previous steps. DRBC will develop a response to comments document, make any necessary changes, and develop the final documentation for adoption by the Commission.

Task E11. Determination of TN and TP criteria consistent with DO criteria determined in step E8 and wasteload and load allocations determined in step E9

After adoption of the DO criteria and new aquatic life use, DRBC will utilize the existing eutrophication model to determine ambient TN and TP concentrations consistent with the new DO criteria and the

wasteload and load allocations from Task E9. These TN and TP concentrations, when achieved in the estuary, will be supportive of the DO criteria determined from Task E8. Since these new TN and TP concentrations already reflect the wasteload and load allocations from previous steps, they are not expected to mandate additional nutrient controls beyond those already identified for achievement of DO. Rather, these TN and TP concentrations will be another expression of the required condition needed to achieve the new DO criteria. Since the new TN and TP concentrations are supportive of the new DO criteria and the new aquatic life use dependent on the DO, they are effects-based.

Task E12. Publication & Public Comment, new estuary TN and TP criteria

DRBC will initiate the public comment process for new estuary TN and TP criteria determined from in the previous step. DRBC will develop a response to comments document, make any necessary changes, and develop the final documentation for adoption by the Commission.

Nutrient Criteria Development in the non-tidal Delaware River

Background and Justification

As stated in the Commission's Water Quality Regulations (Administrative Manual –Part III, 18 CFR PART 410), in waters designated as Special Protection Waters (SPW):

> *It is the policy of the Commission that there be no measurable change in existing water quality except towards natural conditions in waters considered by the Commission to have exceptionally high scenic, recreational, ecological, and/or water supply values.*

SPW designation applies to all non-tidal portions of the Delaware River including:

- The Upper Delaware Scenic and Recreational River (Delaware River between River Mile 330.7 and 258.4);
- The Middle Delaware Scenic and Recreational River (Delaware River between River Miles 250.1 and 209.5);
- The Delaware River between River Miles 258.4 (the downstream boundary of the Upper Delaware Scenic and Recreational River) and 250.1 (the upstream boundary of the Delaware Water Gap National Recreation Area);
- The Lower Delaware River between River Miles 209.5 (the downstream boundary of the Delaware Water Gap National Recreation Area) and 134.34 (the Calhoun Street Bridge near the Head of Tide at Trenton, NJ).

In SPW, numeric definitions of Existing Water Quality (EWQ) were established on both the mainstem and tributaries through monitoring and analysis of key water quality parameters including major nutrients such as:

- total phosphorus;
- orthophosphorus;
- total Kjeldahl nitrogen;
- nitrate; and
- ammonia.

New or expanding waste water treatment plants must demonstrate to the Commission that their proposed projects will not cause a change to EWQ, typically through the application of a water quality model.

In 2016, the Commission published an assessment of the effectiveness of the SPW program in the Lower Delaware, where most point discharges in the non-tidal drainage are located (DRBC 2016). This assessment indicated that at most locations, for most parameters, EWQ is being preserved. In addition,

for most nutrients at most locations, there is evidence of improvement as reflected in reduced nutrient concentrations over time. A US Geological Survey study published shortly after using different data and different assessment techniques, also showed declining nutrient concentrations in the mainstem Delaware River, corroborating the results of the Commission assessment (USGS 2017). As such, we conclude that the SPW program is effective at controlling nutrients in the non-tidal River.

In November 2017, the Commission conferred with EPA to determine whether EWQ nutrient targets could be interpreted as satisfying the requirements for numeric nutrient criteria in the non-tidal Delaware River. While the consensus was that EWQ targets protect water quality and are conferring a benefit related to controlling nutrients in SPW, EWQ targets could *not* be considered as numeric nutrient criteria due to several differences cumulatively, including:

- Implementation of SPW does not include reasonable potential analysis on all NPDES renewals in SPW;
- EWQ targets are not specifically effects-based.

Tasks and Schedule

Since the SPW program is effective at controlling nutrients in the non-tidal, and the Commission's attention and resources will be focused on developing the estuary eutrophication model and revised DO estuary criteria for the next several years, action on adopting non-tidal numeric nutrient criteria will be deferred until after the estuary work is complete.

When the estuary work has been completed, as described in the previous section, the Commission will develop effects-based numeric criteria for TN and TP, using the best available information at that time. Given the broad, ongoing research into appropriate numeric nutrient criteria in freshwater environments, we presume that there will be sufficient foundation in the existing literature at that time to allow for identification and recommendation of appropriate criteria.

Task	Description	Completion Goal
N1	Identification of effects-based TN and TP criteria for the non-tidal Delaware River	December 2024
N2	Publication & Public Comment, new TN and TP criteria	July 2025

Selected Cited Reference

DRBC. September 13, 2017. Resolution NO. 2017-4, A Resolution to Recognize That Evidence Supports Further Study on the Inclusion of Propagation as a Designated Use in Zones 3 and 4 and the Upper Portion of Zone 5 of the Delaware River Estuary; to Provide for Such Studies to be Undertaken in Consultation with Co-Regulators and Dischargers; and to Direct the Executive Director to Initiate DRBC Rulemaking to Revise the Designated Aquatic Life Uses Consistent with the Results of the Identified Studies and the Objectives and Goals of the Federal Clean Water Act. ([HYPERLINK "http://www.nj.gov/drbc/library/documents/Res2017-04_%20EstuaryExistingUse.pdf"])

DRBC. September 13, 2017. Resolution for the Minutes Authorizing and Directing the Executive Director to Require Additional Nutrient Monitoring for Point Source Discharges to the Delaware River Estuary and Bay (Water Quality Zones 2 – 6) for Development and Calibration of the Delaware Estuary Eutrophication Model. ([HYPERLINK "http://www.nj.gov/drbc/library/documents/ResforMinutes091317_nutrient-mon.pdf"])

DRBC. 2016. Lower Delaware River Special Protection Waters Assessment of Measurable Changes to Existing Water Quality, Round 1: Baseline EWQ (2000-2004) vs. Post-EWQ (2009-2011). Delaware River Basin Commission, DRBC/NPS Scenic Rivers Monitoring Program, West Trenton, NJ. Authors: Robert Limbeck, Eric Wentz, Erik Silldorff, John Yagecic, Thomas Fikslin, Namsoo Suk. ([HYPERLINK "http://www.nj.gov/drbc/programs/quality/lower-delaware_EWQassessment2016.html"])

DRBC. December 4, 2013. Administrative Manual –Part III, WATER QUALITY REGULATIONS WITH AMENDMENTS THROUGH DECEMBER 4, 2013, 18 CFR PART 410. ([HYPERLINK "http://www.nj.gov/drbc/library/documents/WQregs.pdf"])

DRBC. December 2013. Delaware River & Delaware Estuary Nutrient Criteria Plan, ver. 2.01. ([HYPERLINK "http://www.nj.gov/drbc/library/documents/nutrients/del-river-estuary_nutrient-plan_dec2013.pdf"])

USEPA. September 22, 2016. Memorandum: Renewed Call to Action to Reduce Nutrient Pollution and Support for Incremental Actions to Protect Water Quality and Public Health. ([HYPERLINK "https://www.epa.gov/sites/production/files/2016-09/documents/renewed-call-nutrient-memo-2016.pdf"])

USGS. 2017. Trends in the quality of water in New Jersey streams, water years 1971–2011, Scientific Investigations Report 2016-5176 Prepared in cooperation with the New Jersey Department of Environmental Protection and the Delaware River Basin Commission. Hickman, R.E. and Hirsch, R. M. ([HYPERLINK "https://pubs.er.usgs.gov/publication/sir20165176"])